

1.0 SCOPE

This specification covers performance, tests and quality requirements for fired wedge connectors. The fired wedge connector will consist of a spring “C” member and a wedge made from a special aluminum alloy of high ductility and electrical conductivity. The “C” member and wedge will be factory coated with a conductive inhibitor containing abrasive particles to help clean the contact surface during installation.

These fired wedge connectors will use a powder-activated cartridge for installation with the proper conductor combinations as described in the Fired Wedge Selection Chart (Table 3-1). When connected, these taps will provide a reliable electrical and mechanical connection for solid, stranded, or compressed conductor combinations, including AAC, AAAC, and ACSR. They may also be used for connecting aluminum and copper conductors providing the aluminum conductor remains on top of the copper conductor and in non-corrosive environments to connect two copper conductors.

Fired wedge connectors will consist of groups coded by different colors according to their cartridge power as described in tap selection chart. Taps will be designed to accommodate various conductor sizes and combinations from 3.25 to 34.93 mm (.128” to 1.375”) outside diameter conductors.

2.0 APPLICABLE PUBLICATIONS AND STANDARDS

Fired wedge connectors are to be rated electrically as Extra Heavy Duty Connectors Class (AA) as described in ANSI C114.9-1998 / Section 3.2 and rated mechanically as Class 3, Minimum Tension – ANSI C119.4 Section 4.4.3.

3.0 PRODUCT REQUIREMENTS

3.1. General

3.1.1. Range

The product line range of the fired wedge connector shall start from streetlight sizes (.128”/3.25mm diameter) to 1192.5 kcmil (1.375”/34.93mm diameter).

3.1.2. Assembly

During assembly, the wedge shall be inserted at a speed of about 40 m/s (130 ft./s) using the specified tool. High-speed insertion with the specified inhibitor is very effective in abrading all sliding surfaces and in disrupting surface oxide film to generate large numbers of contact spot in the electrical interfaces.

3.1.3. Hot stick

A hot stick kit shall be designed for use with the specified tool.

3.1.4. Dis-assembly

A system of take-off clips shall be designed for use with the specified tool.

Upon dis-assembly the conductor should show only minimal deformation at the location where the connector was removed.

3.1.5. Performance

The supplier of the fired wedge connector system shall provide evidence for a minimum of 20 years of proven track record in the field to assure system quality.

3.1.6. Training

The supplier shall provide full in-house training of all users in the correct application and removal of the fired wedge connector and associated products. An annual refresher course also shall be provided.

3.1.7. Documentation

The supplier shall provide documentation on the proper selection and use of the fired wedge connector system as follows:

- a) MSDS
- b) Catalogues
- c) Selection Guides
- d) Custom Tap Chart
- e) Tool Policy
- f) Qualification Test reports
- g) Manuals on Wedge-Connector Technology in Power Utility Application

3.2. **Design Requirements**

3.2.1. C Member

- a) The C members shall be formed from extruded aluminum so that the grain (extrusion direction) runs perpendicular to the conductors (e.g. from C groove end to C groove end). This orientation of grain direction provides for lower rates of stress relaxation in the metal. This maintains the level of contact pressure at or near the value at initial installation for the life of the connection. Susceptibility to stress corrosion cracking is also improved.
- b) The material used shall be a specially designed version of Al 6061 (tighter tolerances on the chemical composition) to ensure consistency of the C member production regarding dimensions and mechanical properties.

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- c) The dimensions for the C members shall be formed to close tolerances to ensure repeatability and reliability of the connection.
- d) The C member shall generate a maximum force after full deflection of .200" (5mm).
- e) The force after .050" (1.25mm) deflection of C member shall be 90% of maximum force (as measured at full deflection of .200" (5mm).
- f) The spring-back of the C member, after full deflection shall be a minimum of .050" (1.25mm)
- g) All sharp edges and burrs shall be removed.
- h) The C members shall be burnished to achieve optimum surface roughness for electrical contact.

3.2.2. Wedge

- a) The dimensions for the wedges shall be manufactured to close tolerances to ensure repeatability and reliability of the connection.
- b) All sharp edges and burrs shall be removed.
- c) The wedges shall be burnished to achieve optimum surface roughness for electrical contact.

3.2.3. Inhibitor

- a) The chemical composition of the inhibitor shall be synthetic and compatible with the rubber gloves used by the utilities.
- b) The inhibitor shall contain special aluminum abrasive particles optimized in size and quantity to ensure repeatability and reliability of the electrical contact made in every connection.

3.2.4. Tool

- a) The tool shall have only four moving parts: the ram, the power unit, the breech cap and the gas release knob.
- b) The tool shall be designed to ensure that it can only be used with the specified cartridge.
- c) The gas produced by the cartridge during installation shall be captive inside the power unit. This shall allow the tool to remain self-supporting on the lines during installation until the gas release knob is turned counterclockwise, releasing the gas produced, and allowing the tool to be removed.

3.2.5. Cartridge

- a) Powder charge repeatability (PCR) is critical to the supply of a reliable product, which can be applied safely and consistently every time. Powder fill weights shall be controllable to +/- .010 grams around the target value with a standard deviation

of less than 0.003 grams. A process capability (Cp) requirement shall be approximately 1.8 or better.

- b) The cartridge shall be designed with the primer cap enclosed to ensure that it can only be used with the specified tool and to insure there is no accidental firing. Cartridge will be lead free and be disposable as non-hazardous waste.

3.3. **Product Qualification – Tests and Test Procedures**

3.3.1. Electrical

The fired wedge connector shall meet the current cycle test requirements per ANSI C119.4-1998 Class AA. When connected as specified, samples shall indicate electrical stability for terminated connectors. The resistance of connection, when measured as specified, shall be stable throughout test. The samples shall be tested to 500 on/off current cycles with the control conductor raised between 175°C to 180°C above ambient.

3.3.2. Mechanical

The fired wedge connector shall meet the mechanical requirements per ANSI C119.4-1998 Class 3, minimum tension. When tested as specified, taps shall not break or separate from cable (wire) until attaining minimum tensile load specified or 5% of the rated cable strength of the weaker conductor.

3.3.3. Corrosion

The fired wedge connector shall meet the following thermal shock / salt spray test.

3.3.3.1. Thermal Shock

Samples shall be subjected to five cycles of thermal shock. Each cycle shall consist of:

- 1) 1 hour at 150°C
- 2) 15 minutes at 0°C water, immediately from the oven
- 3) 30 minutes at 150°C
- 4) 20.75 hours at room temperature

3.3.3.2. Salt Spray Corrosion

Samples shall be subjected to a 30-day salt spray corrosion test. Each daily exposure shall consist of:

- 1) 15 hours in 5% salt spray atmosphere
- 2) 1 hour in a drying oven at 100°C
- 3) 8 hours at room temperature

The supplier also shall supply marine atmospheric environmental study on the performance of their products, minimum four year's duration.

3.4. **Product Identification**

- 3.4.1. Each C member design and wedge design shall be marked with a distinct identification code. This identification code also shall be marked on the packaging to ensure that the correct parts are used for the application. The installer can make a quick visual check before installing.
- 3.4.2. On each wedge the distinct identification code shall be located on the side of the largest radius groove to ensure consistent and error-free installation.

3.5. **Quality Assurance Requirements**

Manufacturing facilities of fired wedge connectors shall provide proof that they are ISO 9001 certified.

3.6. **Selection Chart**

Fired wedge connectors shall be compatible with the wire combinations shown in Table 3-1.

FIRED WEDGE CONNECTORS

For Overhead Line Applications

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TDMIS-9033

Revised 11/2019

Table 3-1: Fired Wedge Connector Selection Table

		MAIN CONDUCTOR												
		795 ACSR (26/7)	750 AAC (37)	600 AAC (37)	556.5 AAC (19)	500 COPPER (37)	477 AAC (19)	336.4 AAC (19)	4/0 COPPER (7)	2/0 COPPER (7)	1/0 AAC (7)	2 COPPER (7)	4 COPPER (SOL)	6 COPPER (SOL)
TAP CONDUCTOR	DIA.	1.11	1	0.89	0.86	0.81	0.79	0.67	0.52	0.41	0.37	0.29	0.2	0.16
6 COPPER (SOL)	0.162							X	X	X	X	X	X	X
4 COPPER (SOL)	0.204							X	X	X	X	X	X	
2 COPPER (7)	0.292				X	X	X	X	X	X	X	X		
1/0 AAC (7)	0.368		X	X	X	X	X	X	X	X	X			
2/0 COPPER (7)	0.414		X	X	X	X	X	X	X	X				
4/0 COPPER (7)	0.522		X	X	X	X	X	X	X					
336.4 AAC (19)	0.666		X	X	X	X	X	X						
477 AAC (19)	0.793		X	X	X	X	X							
500 COPPER (37)	0.813		X	X	X	X								
556.5 AAC (19)	0.856	X	X	X	X									
600 AAC (37)	0.891	X	X	X										
750 AAC (37)	0.997	X	X											
795 ACSR (26/7)	1.108	X												